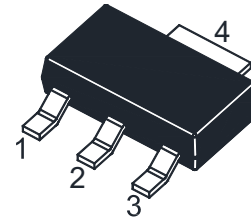
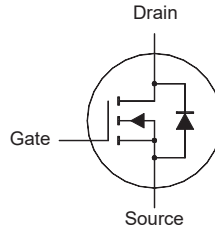


N-Channel Enhancement Mode MOSFET

Features

- Surface-mounted package
- Halogen and Antimony Free(HAF), RoHS compliant



1.Gate 2.Drain 3.Source 4.Drain
SOT-223 Plastic Package

Key Parameters

Parameter	Value	Unit
BV_{DS}	500	V
$R_{DS(ON)}$ Max	20 @ $V_{GS} = 10$ V	Ω
$V_{GS(th)}$ typ	3.2	V
Q_g typ	2.2 @ $V_{GS} = 10$ V	nC

Absolute Maximum Ratings(at $T_a = 25^\circ\text{C}$ unless otherwise specified)

Parameter	Symbol	Value	Unit
Drain-Source Voltage	V_{DS}	500	V
Gate-Source Voltage	V_{GS}	± 30	V
Drain Current	I_D	$T_c = 25^\circ\text{C}$ 0.46 $T_c = 100^\circ\text{C}$ 0.28	A
Peak Drain Current, Pulsed ¹⁾	I_{DM}	1	A
Avalanche Current	I_{AS}	0.6	A
Single Pulse Avalanche Energy ²⁾	E_{AS}	15.6	mJ
Power Dissipation	P_D	10.4	W
Operating Junction and Storage Temperature Range	T_J, T_{stg}	- 55 to + 150	$^\circ\text{C}$

Thermal Characteristics

Parameter	Symbol	Max.	Unit
Thermal Resistance from Junction to Case	$R_{\theta JC}$	12	$^\circ\text{C/W}$
Thermal Resistance from Junction to Ambient ³⁾	$R_{\theta JA}$	80	$^\circ\text{C/W}$

¹⁾ Pulse Test: pulse width limited by junction temperature $T_{J(MAX)} = 150^\circ\text{C}$.

²⁾ Limited by $T_{J(MAX)}$, starting $T_J = 25^\circ\text{C}$, $L = 79$ mH, $R_g = 25 \Omega$, $I_{AS} = 0.6$ A, $V_{GS} = 10$ V.

³⁾ Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.

Characteristics at $T_a = 25^\circ\text{C}$ unless otherwise specified

Parameter	Symbol	Min.	Typ.	Max.	Unit
STATIC PARAMETERS					
Drain-Source Breakdown Voltage at $I_D = 250\ \mu\text{A}$	BV_{DSS}	500	-	-	V
Drain-Source Leakage Current at $V_{DS} = 400\ \text{V}$	I_{DSS}	-	-	1	μA
Gate Leakage Current at $V_{GS} = \pm 24\ \text{V}$	I_{GSS}	-	-	± 100	nA
Gate-Source Threshold Voltage at $V_{DS} = V_{GS}$, $I_D = 250\ \mu\text{A}$	$V_{GS(th)}$	2	-	4	V
Drain-Source On-State Resistance at $V_{GS} = 10\ \text{V}$, $I_D = 0.3\ \text{A}$	$R_{DS(on)}$	-	16.4	20	Ω
DYNAMIC PARAMETERS					
Forward Transconductance at $V_{DS} = 20\ \text{V}$, $I_D = 0.3\ \text{A}$	g_{FS}	-	303	-	mS
Gate Resistance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 0\ \text{V}$, $f = 1\ \text{MHz}$	R_g	-	7.5	-	Ω
Input Capacitance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 250\ \text{V}$, $f = 1\ \text{MHz}$	C_{iss}	-	42	-	pF
Output Capacitance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 250\ \text{V}$, $f = 1\ \text{MHz}$	C_{oss}	-	9	-	pF
Reverse Transfer Capacitance at $V_{GS} = 0\ \text{V}$, $V_{DS} = 250\ \text{V}$, $f = 1\ \text{MHz}$	C_{rss}	-	5	-	pF
Gate charge total at $V_{DS} = 250\ \text{V}$, $I_D = 1\ \text{A}$, $V_{GS} = 10\ \text{V}$	Q_g	-	2.2	-	nC
Gate to Source Charge at $V_{DS} = 250\ \text{V}$, $I_D = 1\ \text{A}$, $V_{GS} = 10\ \text{V}$	Q_{gs}	-	1	-	nC
Gate to Drain Charge at $V_{DS} = 250\ \text{V}$, $I_D = 1\ \text{A}$, $V_{GS} = 10\ \text{V}$	Q_{gd}	-	0.7	-	nC
Turn-On Delay Time at $V_{DD} = 250\ \text{V}$, $I_D = 0.3\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_G = 24\ \Omega$	$t_{d(on)}$	-	6	-	ns
Turn-On Rise Time at $V_{DD} = 250\ \text{V}$, $I_D = 0.3\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_G = 24\ \Omega$	t_r	-	28	-	ns
Turn-Off Delay Time at $V_{DD} = 250\ \text{V}$, $I_D = 0.3\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_G = 24\ \Omega$	$t_{d(off)}$	-	10	-	ns
Turn-Off Fall Time at $V_{DD} = 250\ \text{V}$, $I_D = 0.3\ \text{A}$, $V_{GS} = 10\ \text{V}$, $R_G = 24\ \Omega$	t_f	-	106	-	ns
Body-Diode PARAMETERS					
Drain-Source Diode Forward Voltage at $I_S = 0.6\ \text{A}$, $V_{GS} = 0\ \text{V}$	V_{SD}	-	-	1.4	V
Body-Diode Continuous Current	I_S	-	-	0.46	A
Body-Diode Continuous Current, Pulsed	I_{SM}	-	-	1	A
Body Diode Reverse Recovery Time at $I_S = 1\ \text{A}$, $di/dt = 100\ \text{A} / \mu\text{s}$	t_{rr}	-	266	-	ns
Body Diode Reverse Recovery Charge at $I_S = 1\ \text{A}$, $di/dt = 100\ \text{A} / \mu\text{s}$	Q_{rr}	-	399	-	nC

Electrical characteristic curves

Fig. 1 Typical Output Characteristics

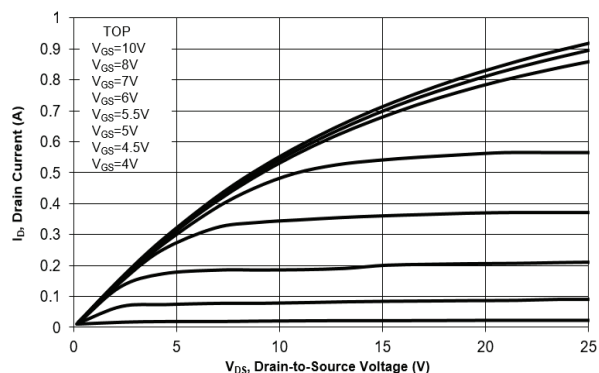


Fig. 2 Typical Transfer Characteristics

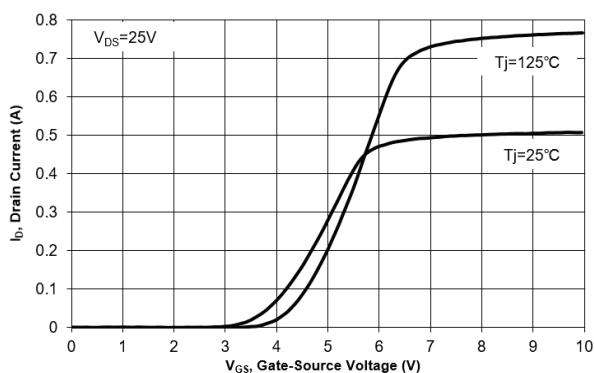


Fig. 3 on-Resistance vs. Drain Current

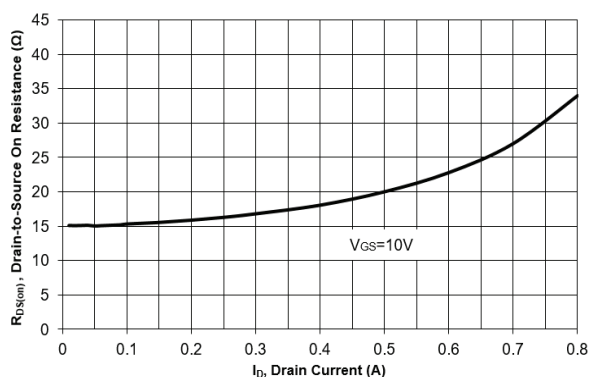


Fig. 4 on-Resistance vs. Gate to Source Voltage

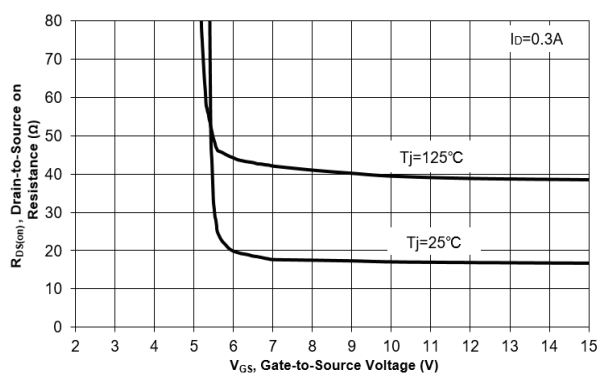


Fig. 5 on-Resistance vs. T_J

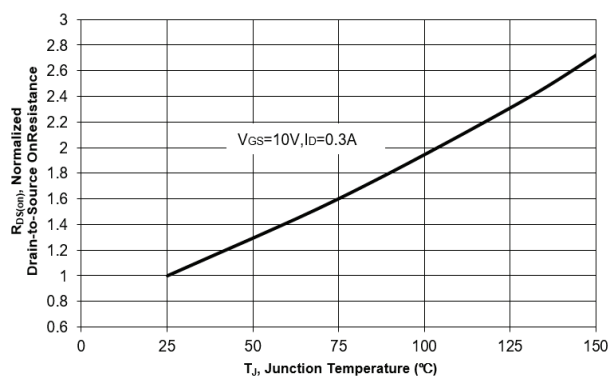


Fig. 6 Typical Body-Diode Forward Characteristics

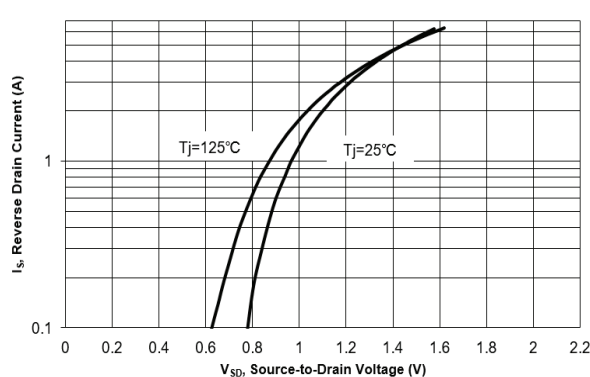


Fig. 7 Typical Junction Capacitance

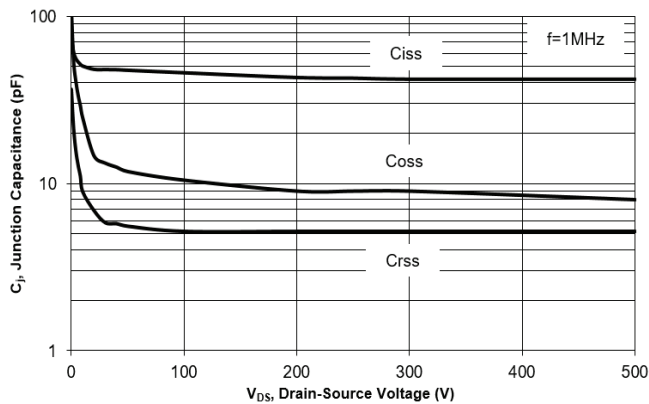


Fig. 8 Drain-Source Leakage Current vs. T_J

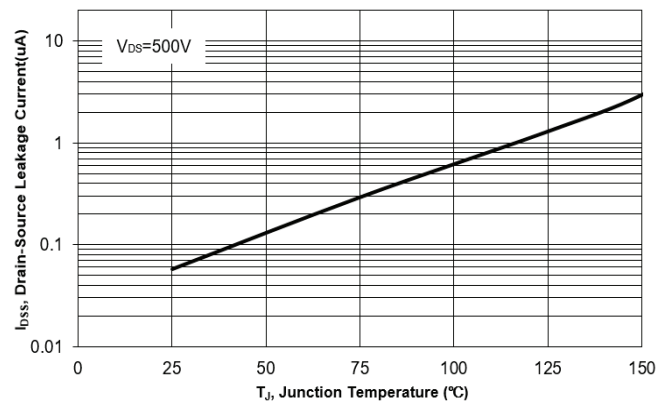


Fig. 9 V_{(BR)DSS} vs. Junction Temperature

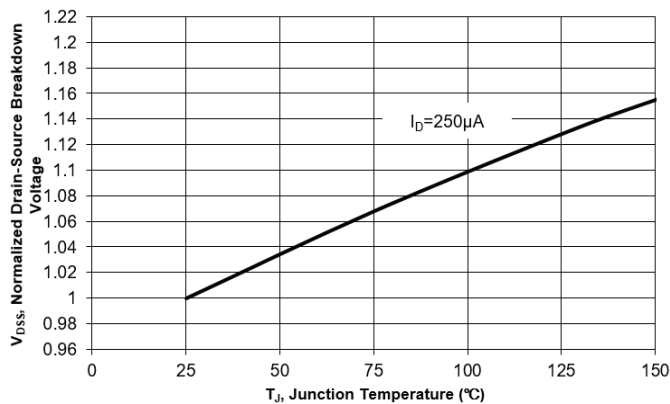


Fig. 10 Gate Threshold Variation vs. T_J

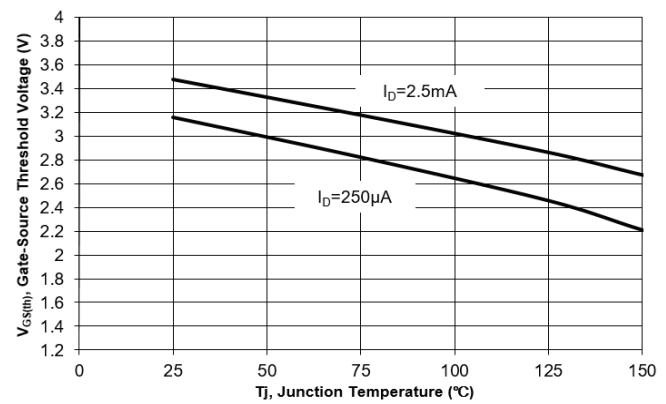


Fig. 11 Gate Charge

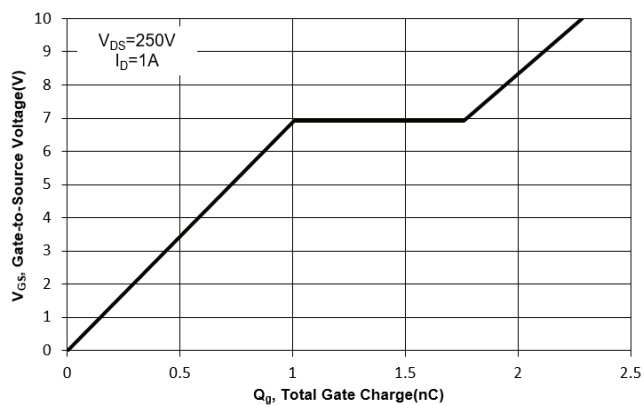
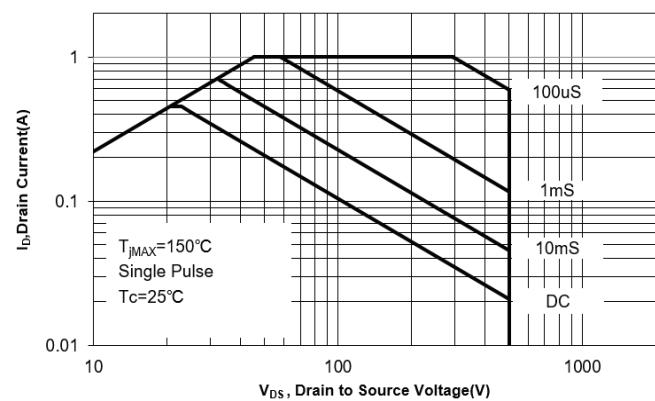


Fig. 12 Safe Operation Area



Electrical Characteristics Curves

Fig. 13 Normalized Maximum Transient Thermal Impedance($Z_{\theta JC}$)

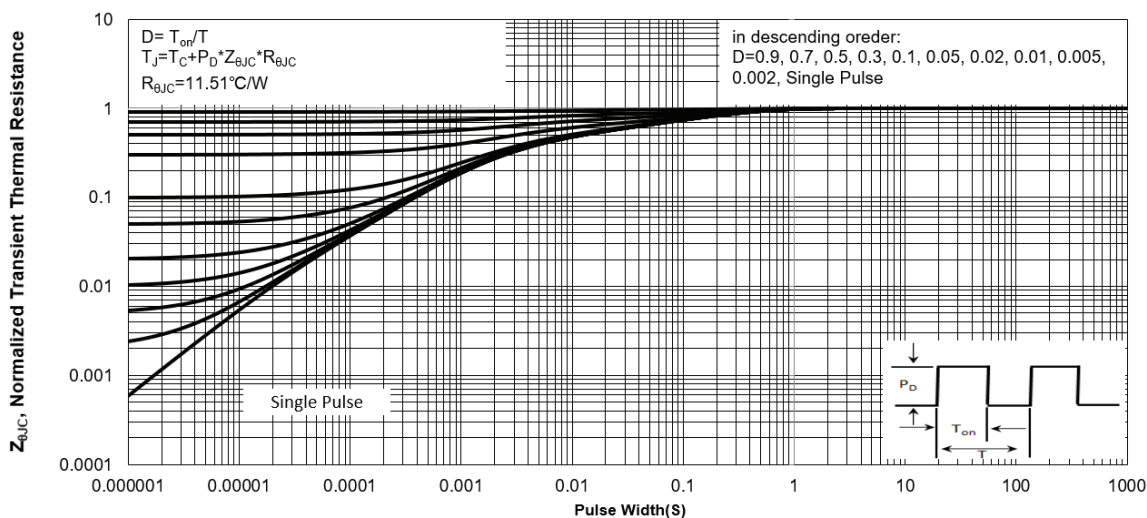
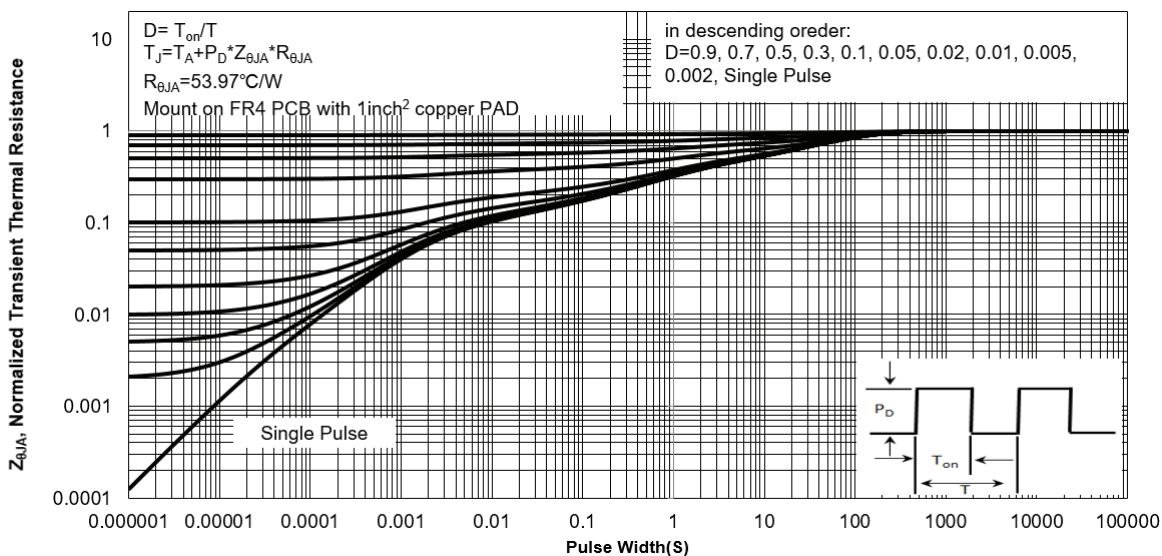


Fig. 14 Normalized Maximum Transient Thermal Impedance($Z_{\theta JA}$)



Test Circuits

Fig.1-1 Switching times test circuit

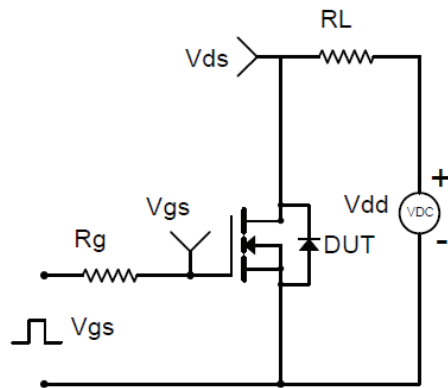


Fig.1-2 Switching Waveform

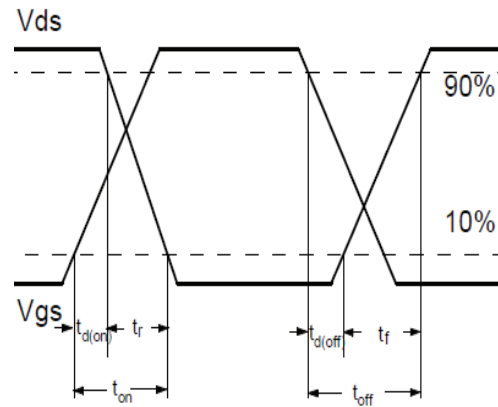


Fig.2-1 Gate charge test circuit

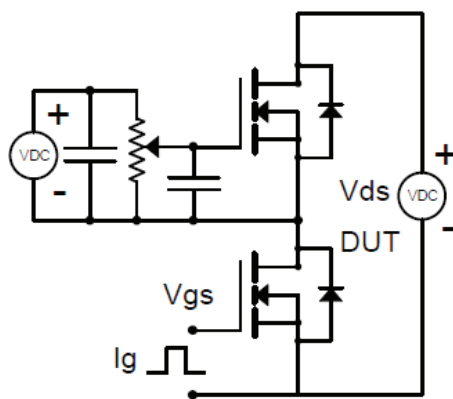


Fig.2-2 Gate charge waveform

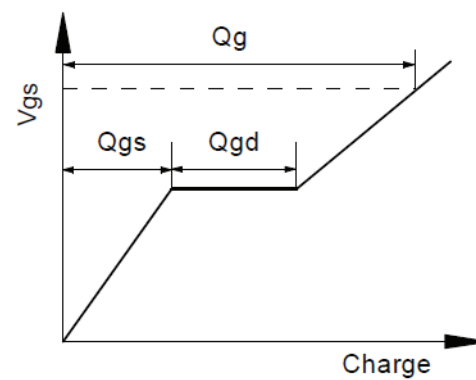


Fig.3-1 Avalanche test circuit

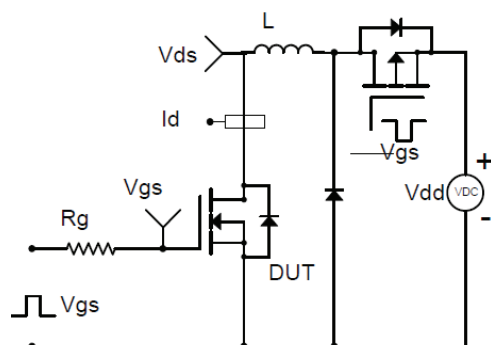
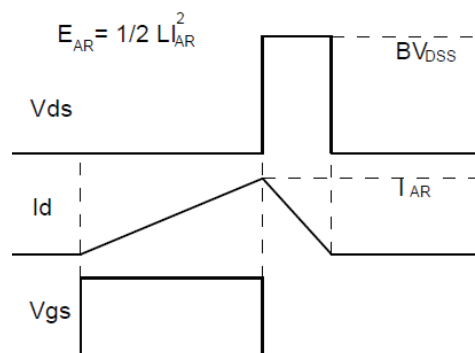
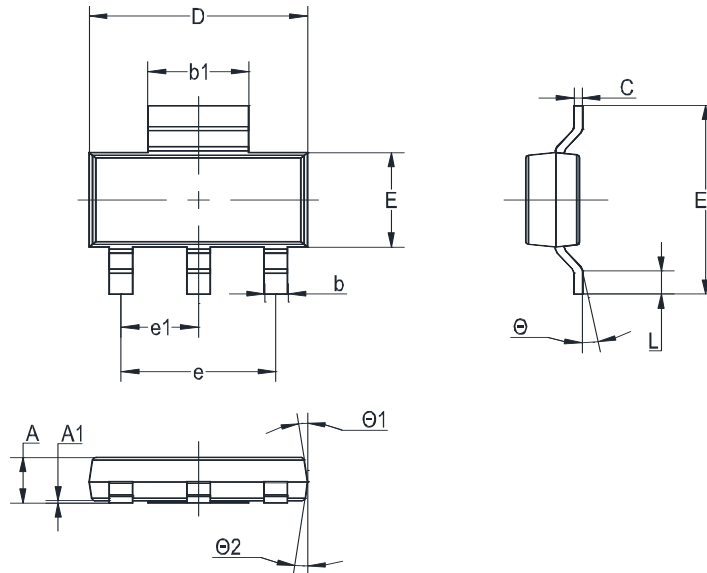


Fig.3-2 Avalanche waveform



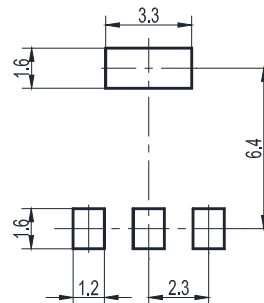
Package Outline (Dimensions in mm)

SOT-223



Unit	A	A1	b	b1	C	D	E	E1	e	e1	L	Θ	Θ1	Θ2
mm	1.8 1.5	0.1 MAX	0.8 0.6	3.1 2.9	0.32 0.22	6.7 6.3	3.7 3.3	7.3 6.7	4.6 TYP	2.3 TYP	1.1 0.7	10° 0°	7° 0°	7° 0°

Recommended Soldering Footprint



Packing information

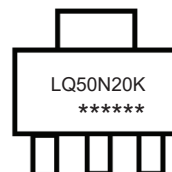
Package	Tape Width (mm)	Pitch		Reel Size		Per Reel Packing Quantity
		mm	inch	mm	inch	
SOT-223	12	8 ± 0.1	0.315 ± 0.004	330	13	3,000

Marking information

" LQ50N20K " = Part No.

" ***** " = Date Code Marking

Font type: Arial



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